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Effect of water solvation on the heat effects of dehydration of alpha-chymotrypsin in organic solvents

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Abstract

© 2014 by Nova Science Publishers, Inc. All rights reserved. Enthalpy changes on the interaction of the dried and hydrated bovine pancreatic α-chymotrypsin (CT) with anhydrous organic solvents (dimethyl sulfoxide (DMSO), formamide, ethylene glycol, and methanol) were measured by isothermal calorimetry at 25°C. Initial hydration level of CT was varied in a wide range of water content (from 0 to 0.3 g water/g enzyme). The interaction enthalpies of the dried CT with anhydrous organic solvents are exothermic. At high water content (more than 0.2 g water/g enzyme), the interaction enthalpies are endothermic for formamide and exothermic for DMSO, methanol, and ethylene glycol. These thermochemical data were analyzed to calculate the molar enthalpies of dehydration of the enzymes in organic liquids. The dehydration enthalpy changes may be endothermic or exothermic depending on the initial water content and the water solvation enthalpy value. The most important conclusions can be described as follows: (i) The solvation of water by hydrophilic organic solvent determines the changes in the dehydration enthalpy values; (ii) The data for the enthalpies of solvation of water by the solvent at infinite dilution reflect this effect.

Keywords

Calorimetry, Enzyme hydration, Heat effects, Organic solvent, Water solvation